

*/ARGUMENTS**The Pending Claims*

The pending claims are directed to chemical-mechanical polishing compositions, as well as methods of polishing a substrate using the same. Claims 1-10, 14-31, and 35-42 currently are pending. Reconsideration of the claims is respectfully requested in view of the remarks herein.

Discussion of the Claim Amendments

Claims 1 and 21 have been amended to recite that the polishing composition is colloidally stable. Support for these amendments can be found in the present specification at paragraph 0030.

No new matter has been added by way of these claim amendments.

Summary of the Office Action

Claims 1-42 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over U.S. Patent Application Publication 2001/0006224 A1 (Tsuchiya et al.) (hereinafter “the Tsuchiya ‘224 publication”).

Discussion of the Obviousness Rejection

The Tsuchiya ‘224 publication discloses a polishing composition comprising silica, an oxidizing agent, and an inorganic salt. The inorganic salt can contain ammonium ions, alkali metal ions, alkaline earth metal ions, group IIIB metal ions, group IVB metal ions, group VB metal ions, and transition metal ions (Tsuchiya publication at paragraph 0029). The Tsuchiya ‘224 publication teaches that the content of inorganic salt must be at least 0.01 wt.% and preferably at least 0.05 wt.% to improve the polishing rate when the polishing composition is used to polish tantalum metal (Tsuchiya publication at paragraph 0040). The Tsuchiya ‘224 publication teaches that it is believed that the inorganic salt used in the disclosed invention aggregates silica particles dispersed in water, and the aggregated silica particles enhance the mechanical polishing effect to provide effective polishing of a tantalum metal film (Tsuchiya ‘224 publication at paragraph 0042).

Thus, the Tsuchiya '224 publication teaches that the amount of inorganic salt must be sufficient to cause aggregation of silica particles present in the disclosed polishing composition, in order to achieve effective polishing of a tantalum film. The term "aggregation" is defined in the art as "any process by which particles collect to form a cohesive mass or cluster" (see, e.g., *The Use of Nomenclature in Dispersion Science and Technology*, V. A. Hackley and C. F. Ferraris, NIST Special Publication 960-3, p. 8 (National Technical Information Service, Technology Administration, U.S. Department of Commerce, Springfield, VA), copy provided herewith). Further, colloidal stability is defined in the art as "[a] physical state that characterizes the relative ability of colloids to remain dispersed in a liquid; suspensions that do not aggregate at a significant rate are said to be colloidally stable" (*ibid.*, p. 10). The ordinarily skilled artisan, on considering the disclosure of the Tsuchiya '224 publication, would readily recognize that the presence of at least 0.01 wt.% of inorganic salt in the polishing composition disclosed therein will lead to colloidal instability of the polishing composition.

By way of contrast, the pending claims recite a polishing composition comprising fumed silica particles, about 2.5×10^{-2} to about 2.5 mmoles/kg of calcium, about 1×10^{-2} to about 1.5 mmoles/kg of strontium, or about 7×10^{-3} to about 0.75 mmoles/kg of barium, based on the total weight of the polishing composition. These ranges are equivalent to about 0.0001 to about 0.01 wt.% of calcium, 0.000088 to about 0.0088 wt.% of strontium, and about 0.000069 to about 0.01 wt.% of barium. The concentration ranges for calcium, strontium, and barium recited in the pending claims touch, but do not overlap, the concentration of inorganic salt disclosed in the Tsuchiya '224 publication. The pending claims further require that the polishing composition is colloidally stable. Colloidal stability is defined by a testing protocol described in the present specification at paragraph 0030. Thus, the polishing composition recited in the pending claims cannot comprise aggregated particles of fumed silica, as taught by the Tsuchiya '224 publication.

As is well established, to establish a case of *prima facie* obviousness, all the claim limitations must be taught or suggested by the prior art. See, e.g., *In re Royka*, 490 F.2d 981, 985, 180 U.S.P.Q. 580, 583 (C.C.P.A. 1974). In the present case, the Tsuchiya '224 publication fails to teach or suggest a polishing composition comprising fumed silica particles, about 2.5×10^{-2} to about 2.5 mmoles/kg of calcium, about 1×10^{-2} to about 1.5

mmoles/kg of strontium, or about 7×10^{-3} to about 0.75 mmoles/kg of barium, based on the total weight of the polishing composition, and wherein the polishing composition is colloidally stable, as recited in the pending claims. Indeed, the Tsuchiya '224 publication teaches *away* from the invention recited in the pending claims, inasmuch as the Tsuchiya '224 publication specifically teaches that the inorganic salt present in the polishing composition aggregates silica particles, and that aggregated silica particles are necessary for the polishing of tantalum metal films. In view of the fact that colloidal stability requires that suspended particles do not aggregate at a significant rate, the polishing composition disclosed in the Tsuchiya '224 publication cannot be colloidally stable.

In view of the foregoing, the present invention as recited in the pending claims is not obvious over the Tsuchiya '224 publication. Accordingly, the obviousness rejection is improper and should be withdrawn.

Conclusion

Applicants respectfully submit that the patent application is in condition for allowance. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,


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